METAL UNDERCOATING	INITIAL STRENGTH	TEMPERATURE ENVIRONMENT	HUMIDITY ENVIRONMENT	GOLD PLATING (CYANIDE GOLD PLATING SOLUTION)	ETCHING	REMARKS
Cu	○	×	×	×	○	
NiCr-BASED METAL	○	×	×	×	○	
NiV-BASED METAL	○	×	×	×	○	
Cr-BASED METAL	○	△	△	○	×	SPECIAL ETCHING ENVIRONMENT LOAD PRODUCTION OF HEXAVALENT CHROMIUM

FIG.1

FIG.2A

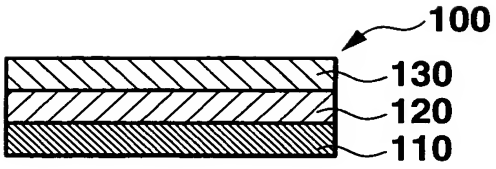


FIG.2B

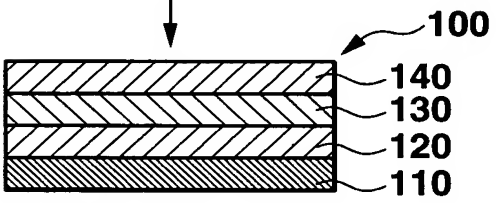


FIG.2C

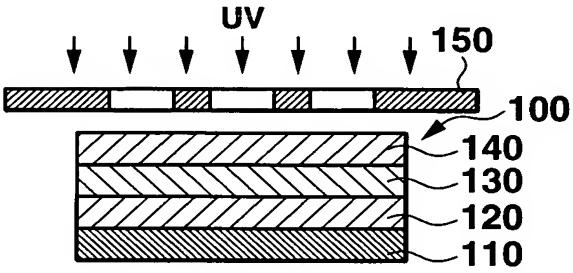


FIG.2D

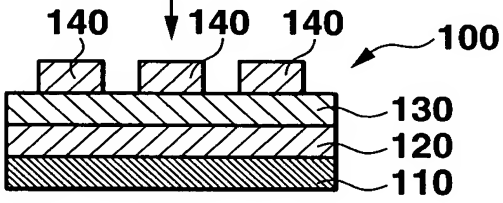


FIG.2E

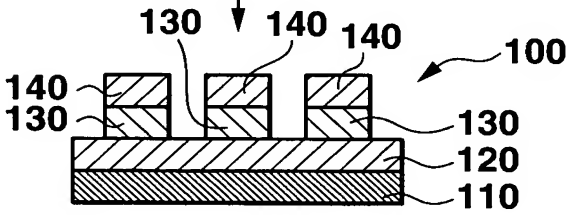


FIG.2F

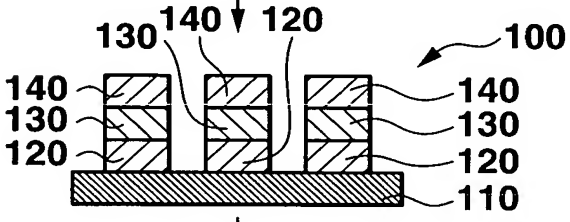


FIG.2G

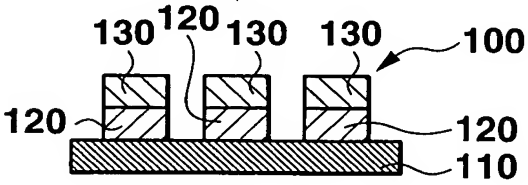


FIG.3A

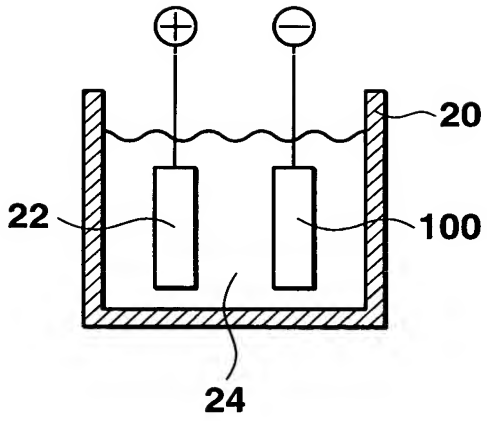


FIG.3B

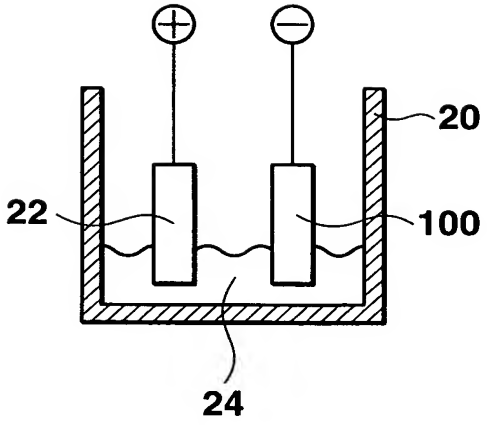
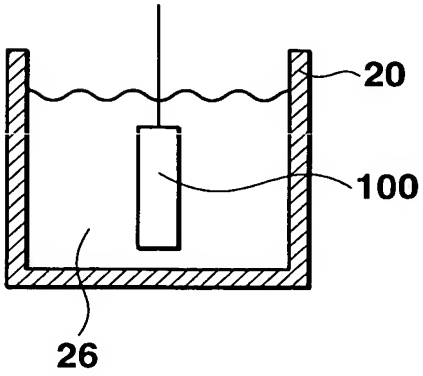


FIG.3C



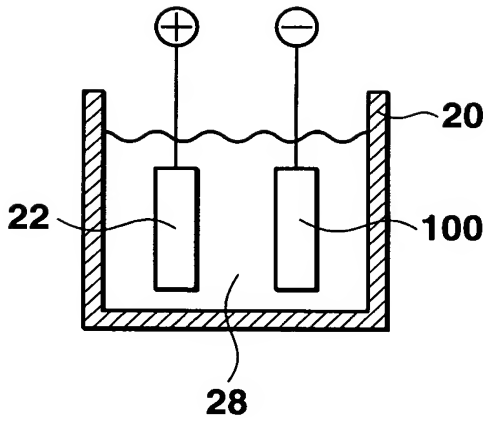


FIG.4

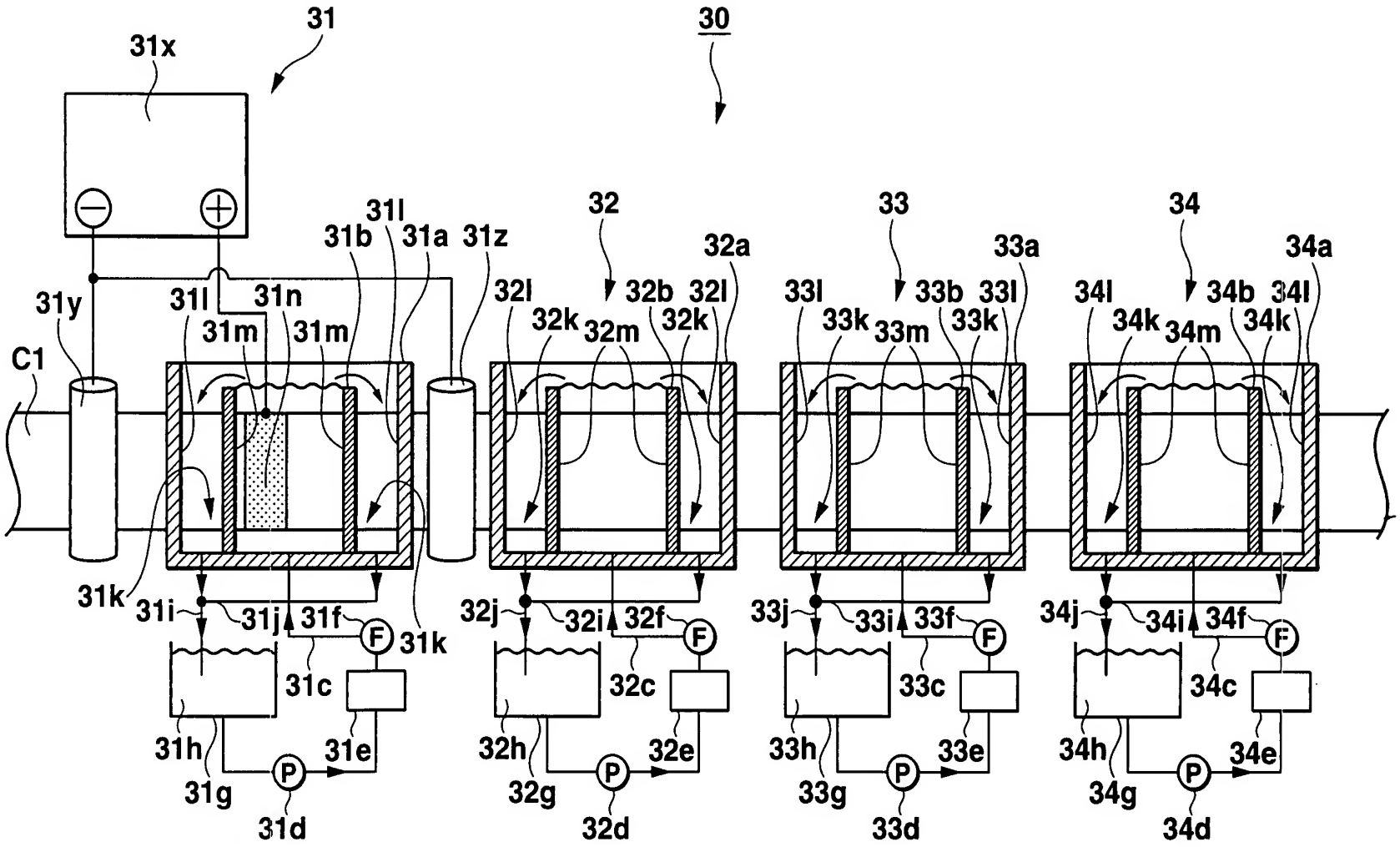

31
30
31x
31y
C1
31l
31n
31m
31m
31b
31l
31a
31z
32
32a
32l
32b
32l
32k
32m
32k
33
33a
33l
33b
33l
33k
33m
33k
34
34a
34l
34b
34l
34k
34m
34k
31k
31i
31j
31f
F
31k
31c
31h
31g
31e
P
31d
32j
32i
32f
F
32c
32h
32g
32e
P
32d
33j
33i
33f
F
33c
33h
33g
33e
P
33d
34j
34i
34f
F
34c
34h
34g
34e
P
34d

FIG.5

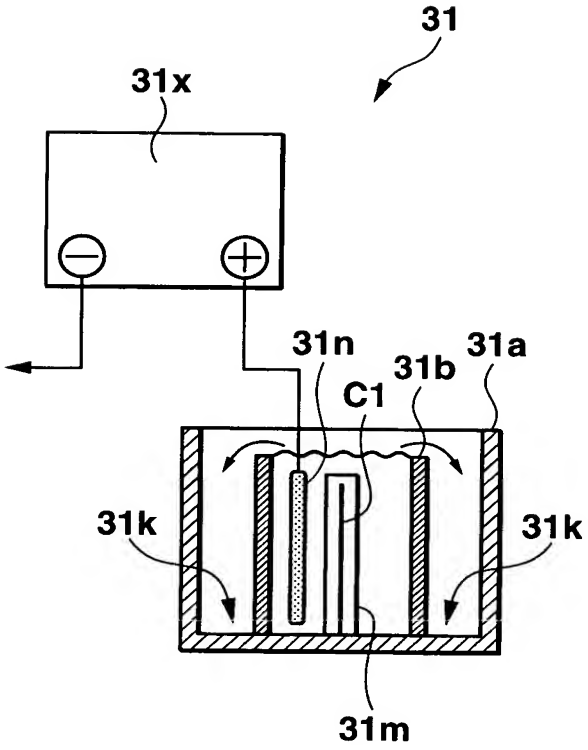


FIG.6

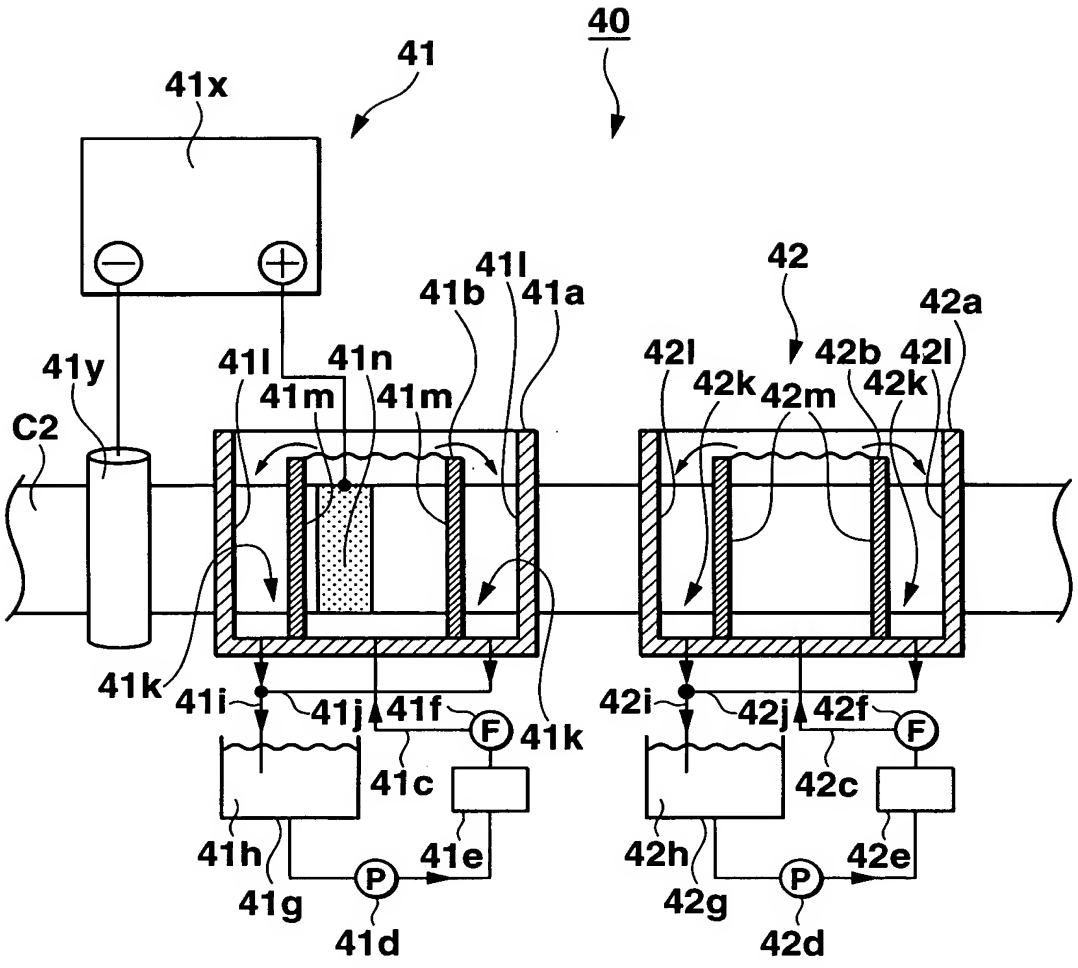

40
41
41x
41y
C2
41l
41n
41m
41m
41b
41l
41a
41k
41i
41j
41f
F
41k
41c
41h
41e
41g
P
41d
42
42a
42l
42b
42l
42k
42m
42k
42i
42j
42f
F
42c
42h
42e
42g
P
42d

FIG.7

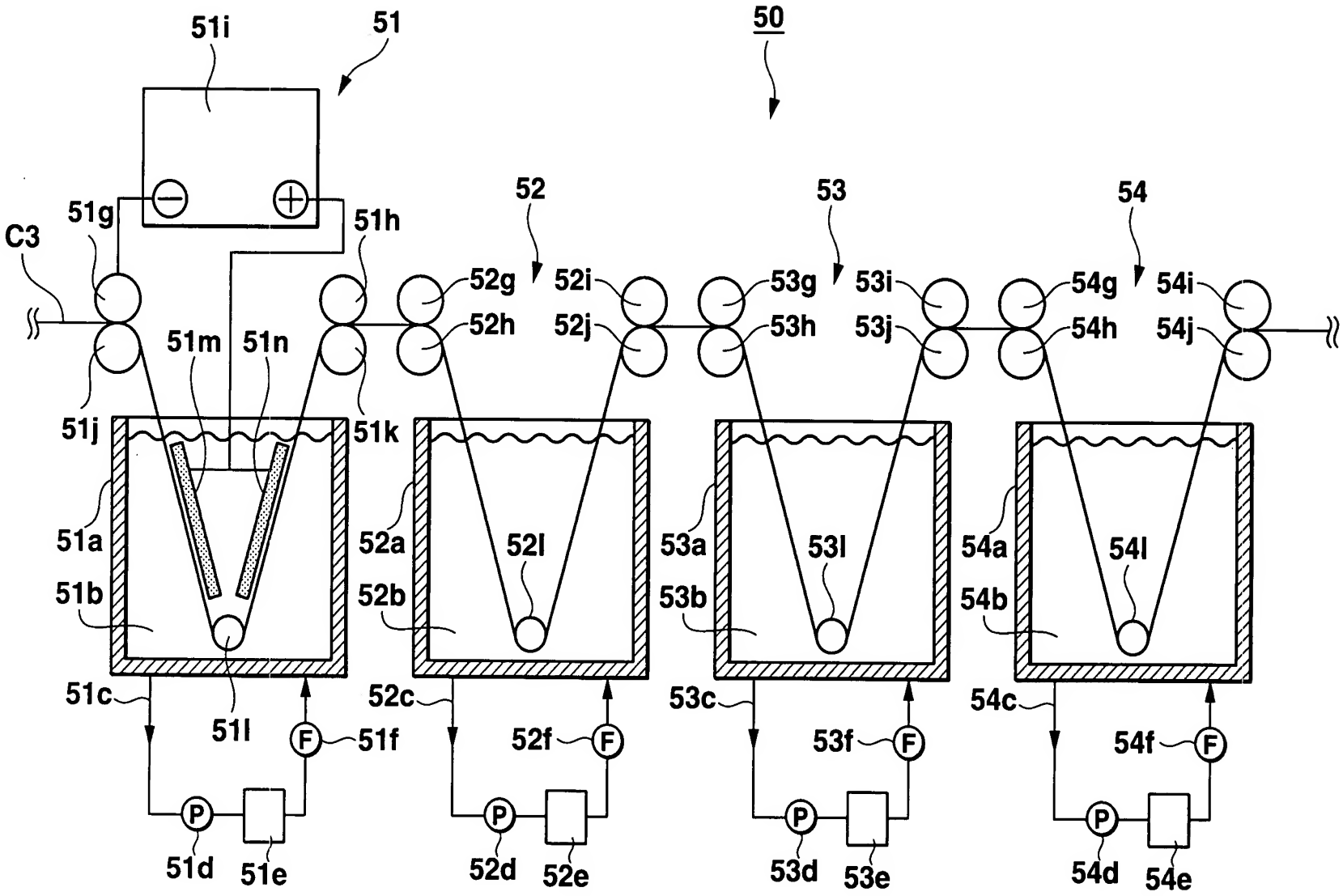

51i
51
50
52
53
54
C3
51g
51h
52g
52i
53g
53i
54g
54i
52h
52j
53h
53j
54h
54j
51m
51n
51j
51k
51a
51b
52a
52l
52b
53a
53l
53b
54a
54l
54b
51c
51l
F
51f
52c
52f
53c
53f
54c
54f
P
51d
51e
52d
52e
53d
53e
54d
54e

FIG.8

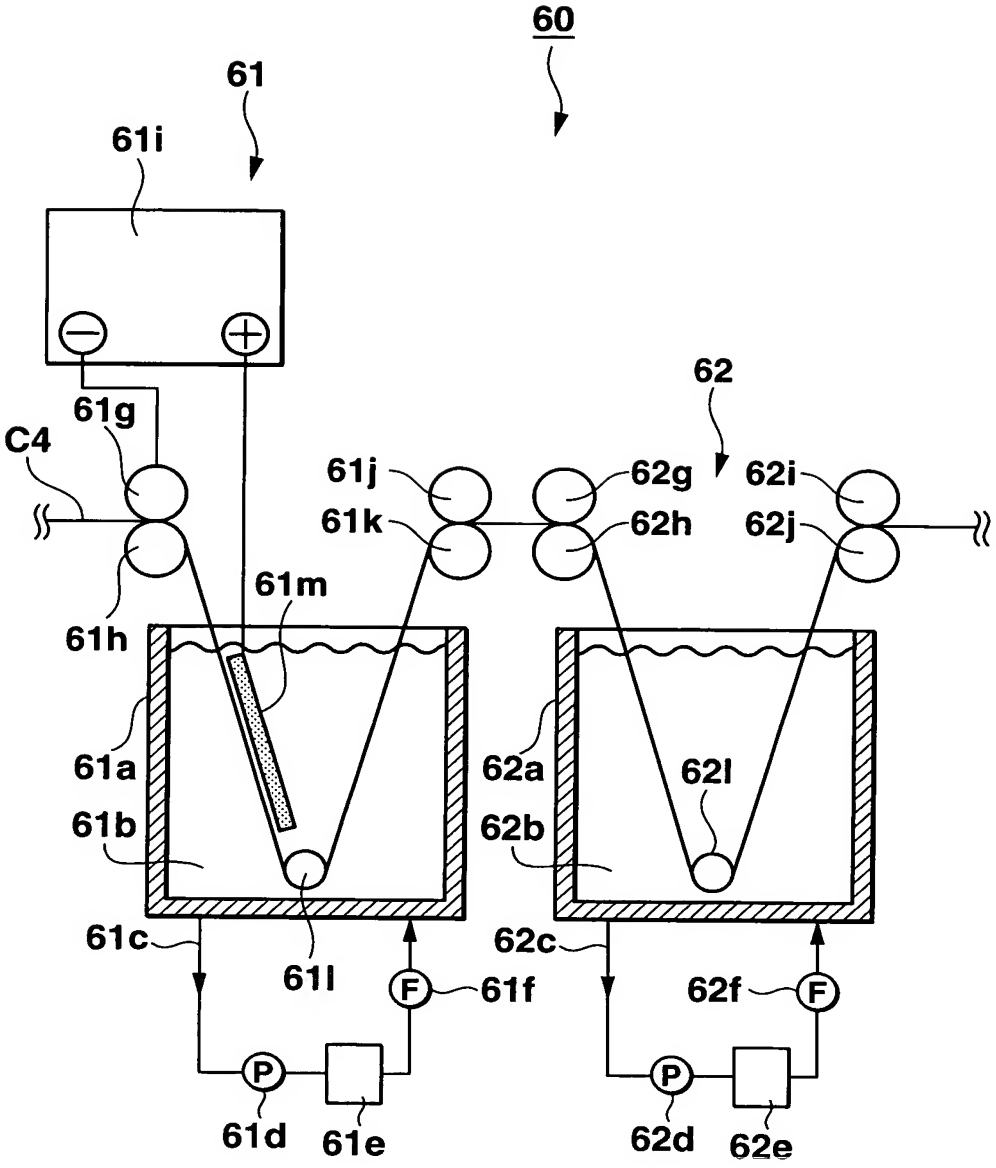

60
61
61i
61g
C4
62
61j
62g
62i
61k
62h
62j
61m
61h
61a
62a
62l
61b
62b
61c
62c
61l
F
61f
62f
F
P
P
61d
61e
62d
62e

FIG.9

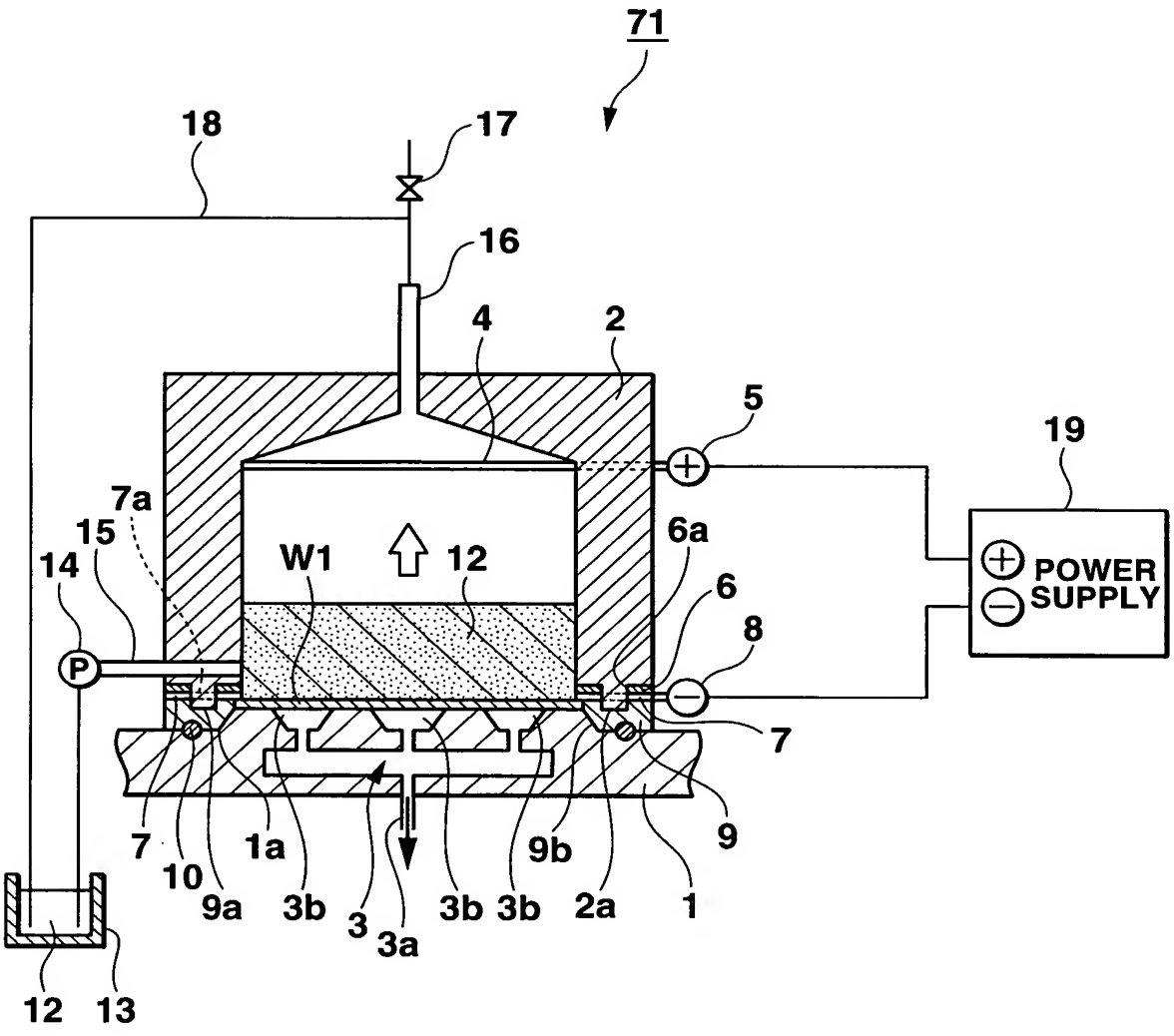

71
18
17
16
4
2
5
19
7a
15
14
W1
12
6a
6
8
POWER SUPPLY
P
7
7
10
9a
1a
3b
3
3a
3b
3b
9b
2a
1
9
12
13

FIG.10

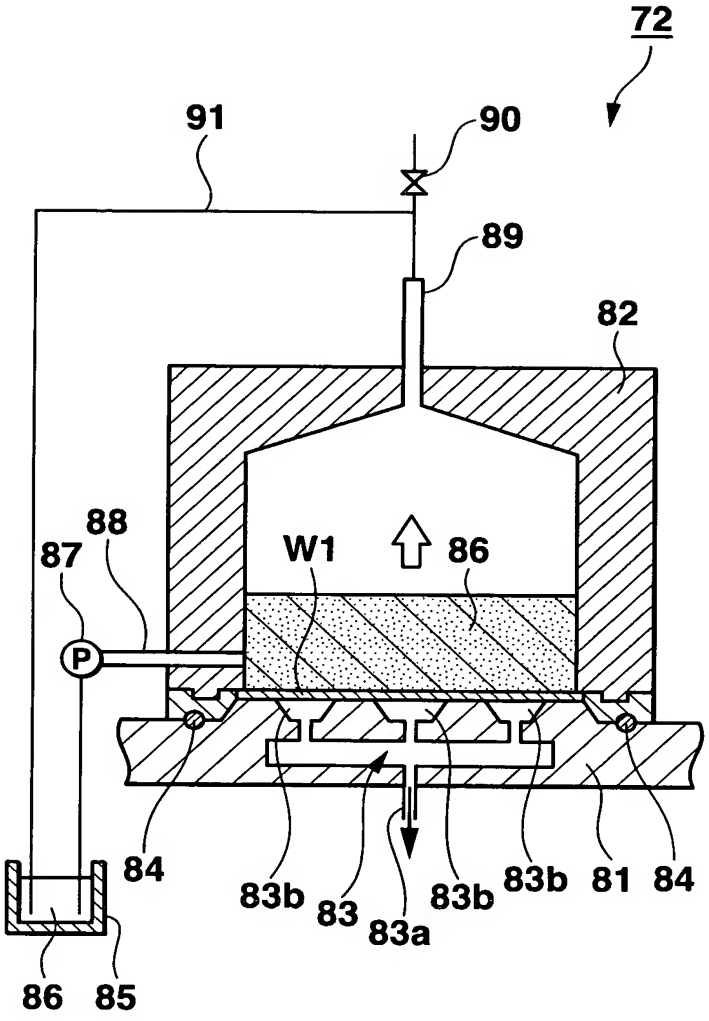


FIG.11

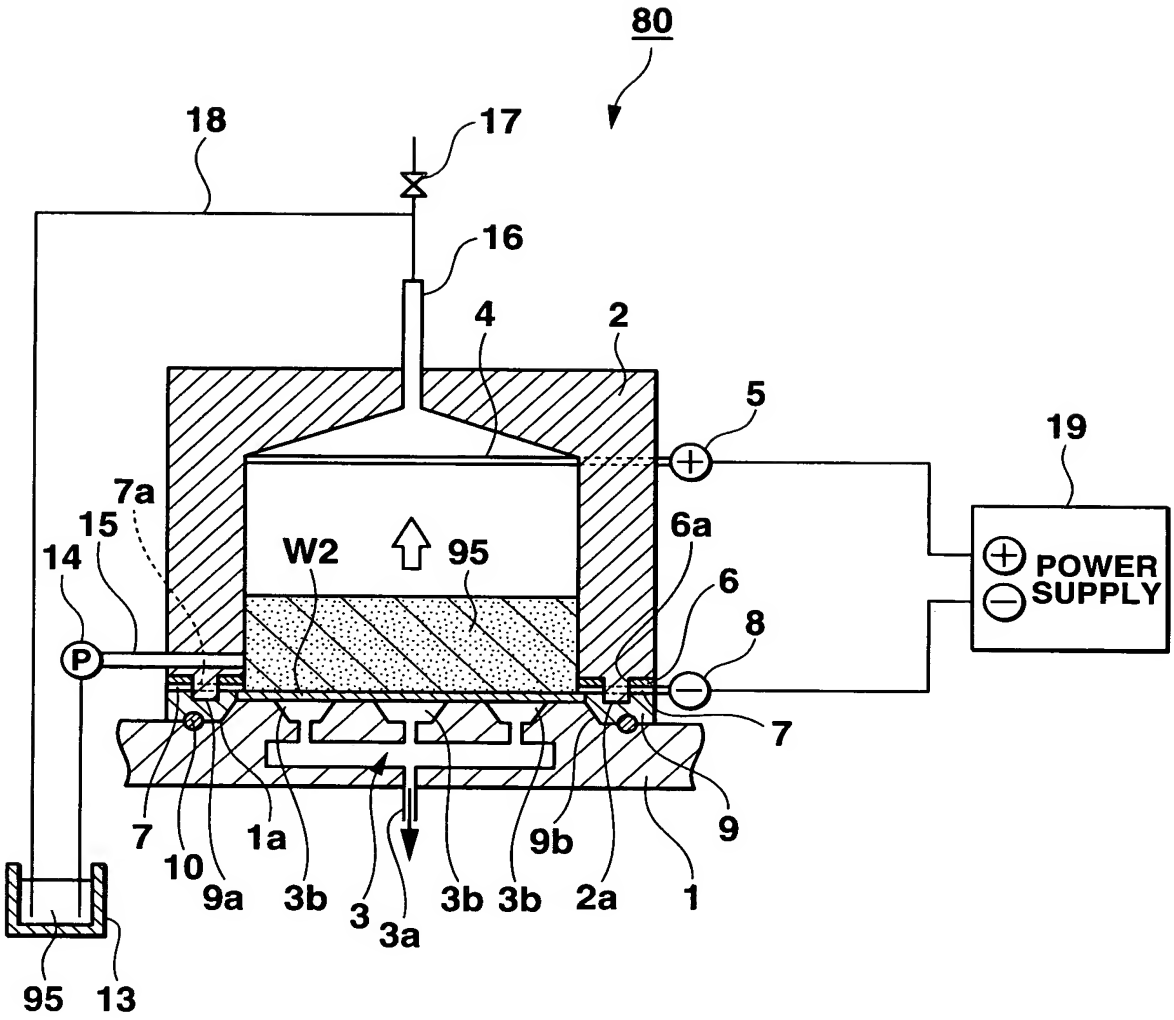

80
18
17
16
4
2
5
19
7a
15
14
W2
95
6a
6
8
POWER SUPPLY
P
7
7
10
9a
1a
3b
3
3a
3b
3b
9b
2a
1
9
95
13

FIG.12

FORM	EXPERIMENT No.	PROPERTIES OF TREATMENT SOLUTION	NAMES OF TREATMENT SOLUTIONS	TREATMENT METHODS	TREATMENT SOLUTION CONCENTRATION (vol%)	ADDITIVE (REDUCING AGENT) CONCENTRATION (vol%)	CURRENT DENSITY (A/dm^2)	TEMPERATURE (°C)	TIME (sec)	Cu PEELING	Cr PEELING
SIMULTANEOUS (A)	1	ALKALINE	A-PROCESS (MANUFACTURED BY MELTEX K.K.)	DIP	100	···	···	50	25	○	×
									30	○	×
									90	○	×
	2	ACIDIC	CUPRIC CHLORIDE HYDROCHLORIC ACID	DIP	20~40	···	···	30	80	×	×
									85	○	×
INDIVIDUAL (B)	3	ACIDIC	SAS (MANUFACTURED BY K.K. MURATA)	DIP	50	···	···	30	30	···	×
					100	···	···	30		···	×
								40		···	×
								50		···	×
	4	ALKALINE	DSL-100 (MANUFACTURED BY K.K. MURATA)	ANODE ELECTROLYSIS OXIDATION	20	···	5	50	20	···	×
									30	···	×
	5	ACIDIC	SAS (MANUFACTURED BY K.K. MURATA)		50	···	5	30	10	···	×
									60	···	×
	6	ACIDIC	SAS (MANUFACTURED BY K.K. MURATA)	CATHODE ELECTROLYSIS REDUCTION	50	···	5	30	10	···	×
	7	ACIDIC	SAS (MANUFACTURED BY K.K. MURATA)	CATHODE ELECTROLYSIS REDUCTION+DIP	50/50	···	5/	30/30	2/8	···	○
									5/8	···	○
	8	ACIDIC+ REDUCING AGENT	SAS (MANUFACTURED BY K.K. MURATA) +SODIUM BISULFITE	DIP	50	0.1	···	30	30	···	×
						0.25				···	×
						0.5				···	×
						1				···	×

FIG.13

EXPERIMENT No.	PARAMETERS	SAS CATHODE ELECTROLYSIS REDUCTION TREATMENT CONDITIONS				SAS DIP TREATMENT CONDITIONS			Cr PEELING
		CONCENTRATION (vol%)	CURRENT DENSITY (A/dm^2)	TEMPERATURE (°C)	TIME (sec)	CONCENTRATION (vol%)	TEMPERATURE (°C)	TIME (sec)	
1	CURRENT DENSITY	50	1	30	2	50	30	17	○
2			5					10	○
3	SAS CONCENTRATION IN DIP TREATMENT	50	1	30	2	5	30	22	○
4						10		20	○
5						20		20	○
6	SAS CONCENTRATION IN CATHODE ELECTROLYSIS REDUCTION TREATMENT	5	1	30	2	5	30	25	○
7		10				10		20	○
8		20				20		20	○

FIG.14

EXPERIMENT No.	TREATMENT METHODS	NaCl SOLUTION CATHODE ELECTROLYSIS REDUCTION TREATMENT CONDITIONS				SAS DIP TREATMENT CONDITIONS			Cr PEELING
		CONCENTRATION (wt%)	CURRENT DENSITY (A/dm^2)	TEMPERATURE (°C)	TIME (sec)	CONCENTRATION (vol%)	TEMPERATURE (°C)	TIME (sec)	
1	CATHODE ELECTROLYSIS REDUCTION USING NaCl SOLUTION	25	1	30	150	• • •	• • •	• • •	×
2	CATHODE ELECTROLYSIS REDUCTION USING NaCl SOLUTION+ DIP USING SAS	25	1	30	2	50	30	25	○

FIG.15

EXPERIMENT No.	CATHODE ELECTROLYSIS REDUCTION TREATMENT SOLUTION	DIP TREATMENT SOLUTION	Cr PEELING
1	NaCl (2N) (pH=5.1)	SAS	○
2	NaCl (2N)+NaOH (pH=7.0)	SAS	○
3	NaCl (2N)+NaOH (pH=9.0)	SAS	○
4	NaCl (2N)+NaOH (pH=10.0)	SAS	○
CONDITIONS	TEMPERATURE: ROOM TEMPERATURE	TEMPERATURE: ROOM TEMPERATURE	
	TIME: 30sec	TIME: 300sec	
	CD: 1A/dm^2	CONCENTRATION: 50%	
	ANODE: Pt		

FIG.16

TREATMENT SOLUTION	HYDROCHLORIC ACID		SULFURIC ACID		NaCl SOLUTION	
DIP TIME (sec)	1	5	1	5	1	5
CHROMIUM (D)	DETECTED	DETECTED	DETECTED	DETECTED	DETECTED	DETECTED
HEXAVALENT CHROMIUM	NOT DETECTED	NOT DETECTED	DETECTED	DETECTED	NOT DETECTED	NOT DETECTED

FIG.17